Use of Regulatory Standards and Thresholds in Constructing Environmental Health Indicators: Advantages and Disadvantages

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Collaborators

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America's Children and the Environment

- EPA's series of reports on key indicators reflecting children's health and the environment
  - Compiles data relevant to children's environmental health in one document
  - Key measures depicting trends in environmental factors related to children's health in the US
- Translate data and science into information that is useful to policymakers, public, & stakeholders

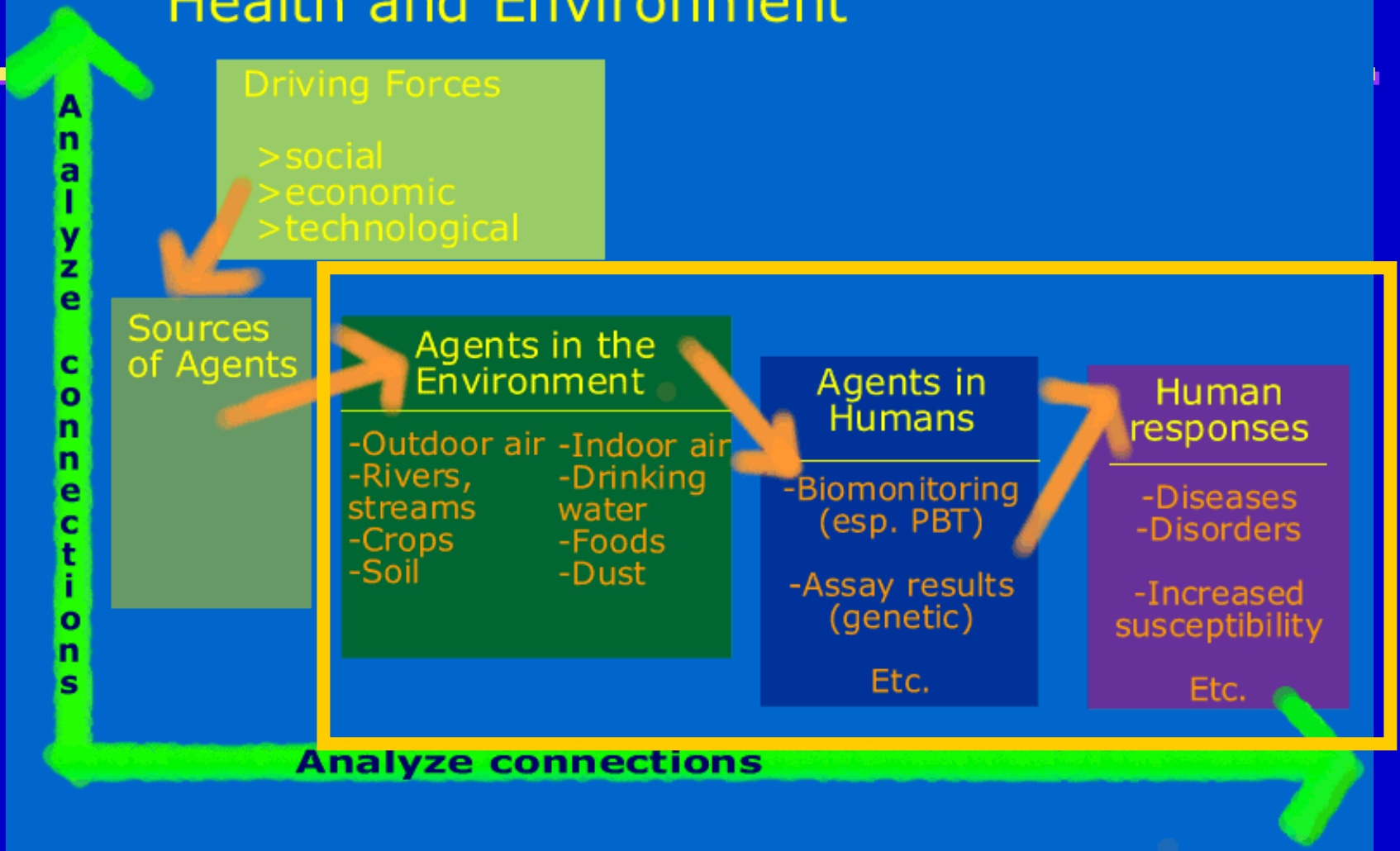
National measures for

- Environmental contaminants
  - Levels of environmental contaminants that are likely to affect children's health
    - Outdoor air pollution, indoor air pollution, drinking water contaminants, food contaminants, land contaminants
- Body burdens
  - Key contaminants measured in the bodies of children and women
    - Concentrations of lead and cotinine in the bodies of children, and mercury in the bodies of women of childbearing age
- Diseases and disorders
  - Illnesses for which there is reason to believe that environmental exposures may play a role
    - Asthma and other respiratory diseases, childhood cancer, attention-deficit/hyperactivity disorder, and mental retardation

Making the link

- Important to show connections between contaminants and health
  - Important to show even if relationships cannot be fully proven or quantified
- Show related measures between groups

Elements of Approach to Understanding Health and Environment



Policy or administrative actions to reduce environmental contamination, exposure, or health effects

Key questions

- Is it changing over time?
  - Why?
- Are there certain populations at risk?
  - Is it different in different geographic areas?
  - Are there differences by race/ethnicity?
  - Are there differences by socio-economic status?

Process

1. Select environmental conditions and health outcomes of greatest relevance
2. Identify best available data
3. **Develop most informative measures**
4. Decide which measures are related
5. Identify limitations, data needs, future directions

Develop most informative measures

- There can be multiple ways to display data
- Focus on what is most transparent and understandable
  - Incorporates best science
  - The graph is what people see
- Regulatory levels are often insufficient as a point of comparison
  - Regulatory levels often incorporate unrelated health and environment information
    - Needed to set achievable goals or targets
  - Sometimes can’t represent depth of science

Regulatory levels & unrelated health information

- Regulatory levels can incorporate concerns other than health
  - Example – Drinking water standards incorporate feasibility, technology and cost/benefit information
- Other considerations
  - Nonattainment designation can include non health related information
    - Example – Nonattainment areas are designated through a notice and comment process
    - Timing can depend on other factors, such as when entered in the Federal Register

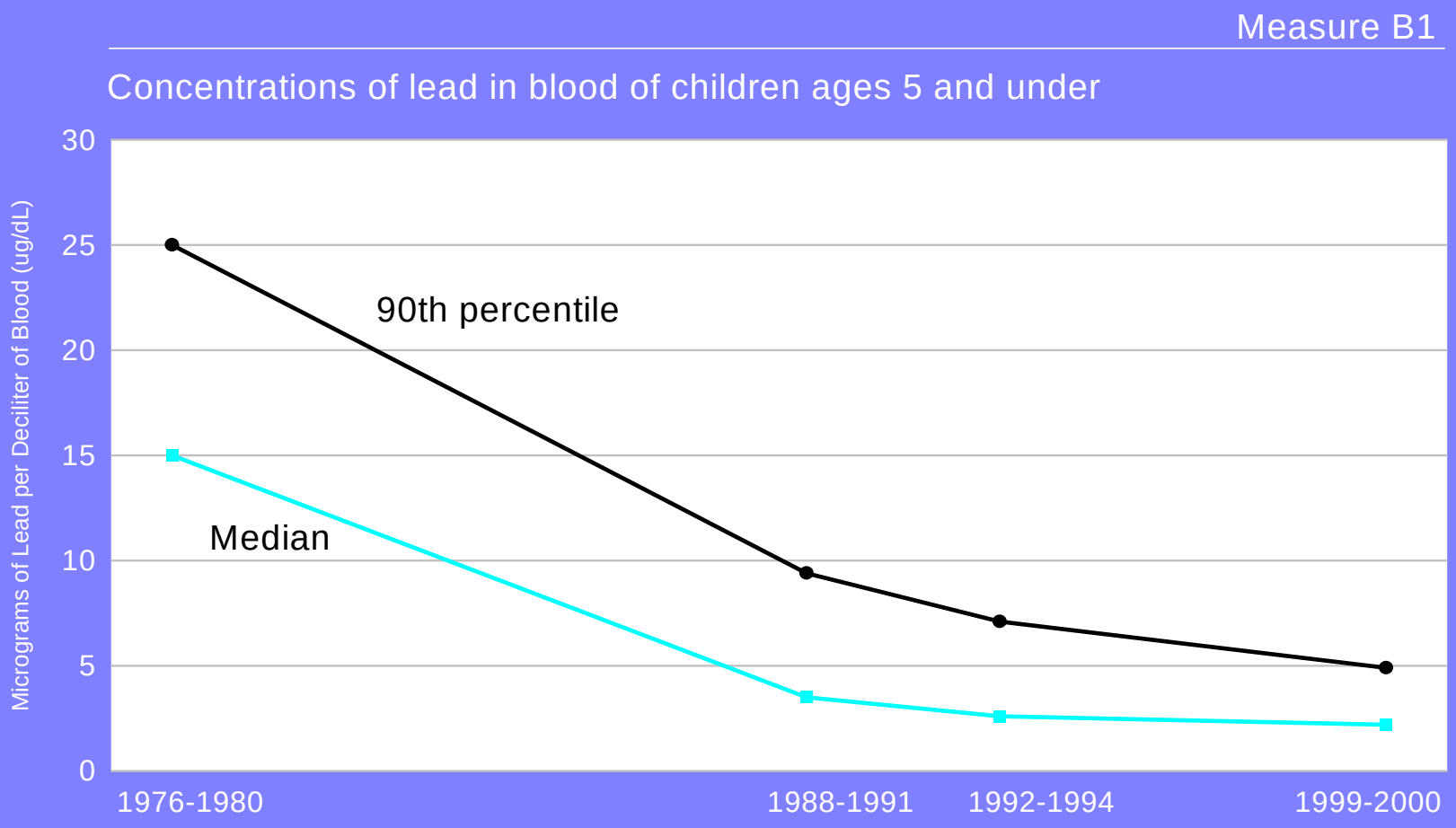
Regulatory levels set targets not science

- Many pollutants do not have a threshold for health effects
  - Regulatory numbers can imply there is a threshold
- Regulatory levels can be useful in some circumstances
    - Complicated by developing science

Example – lead

- There is no known threshold health effects from lead
- CDC considers 10 ug/dL in blood as an elevated level
  - "..intervention level ...10 ug/dL"
- Using 10 ug/dL as a target line can erroneously imply that there is a "safe" level of lead
  - This implies the job is done when children have less than 10 ug/dL

Blood lead in children



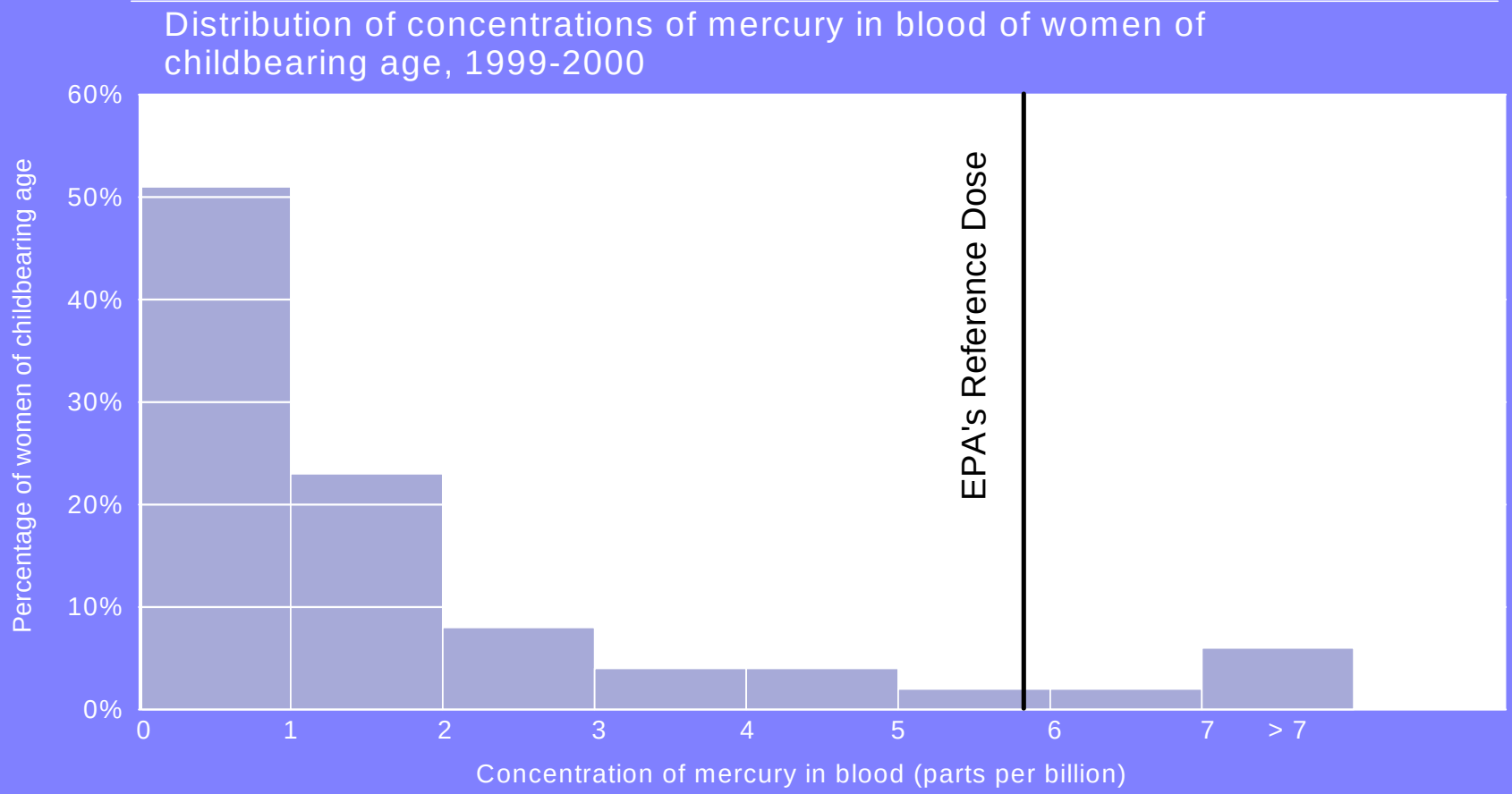
SOURCE: America's Children and the Environment, www.epa.gov/envirohealth/children
DATA: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health and Nutrition Examination Survey

Example – mercury

- Useful for how many people are in an “at risk” group
- Understanding of mercury science less evolved than lead
  - No identified threshold
  - Still trying to show people the problem

Mercury blood levels

Measure B4



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Data: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health and Nutrition Examination Survey

Note: EPA's reference dose (RfD) for methylmercury is 0.1 micrograms per kilogram body weight per day.
This is approximately equivalent to a concentration of 5.8 parts per billion mercury in blood.

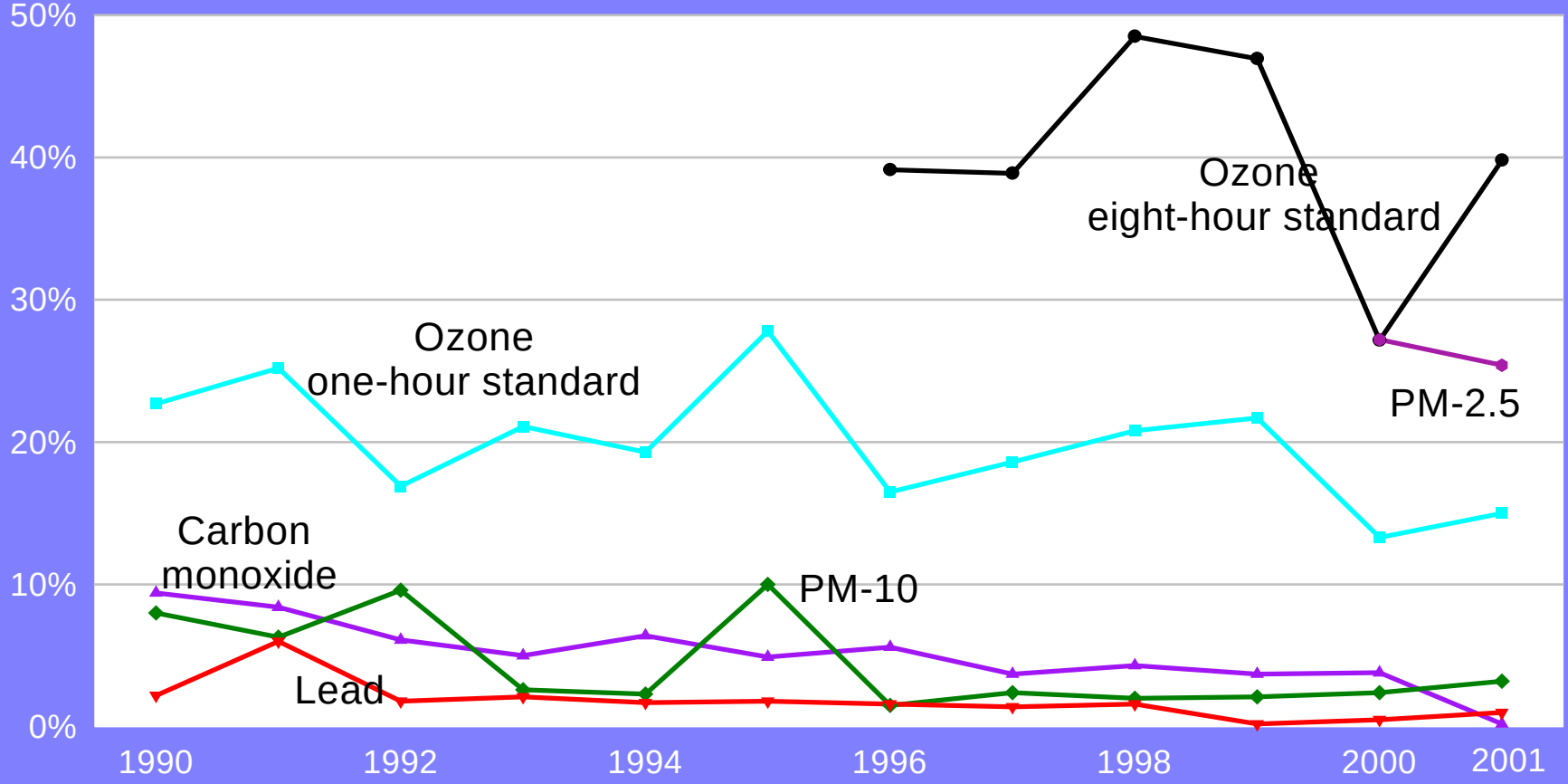
Regulatory levels can be well understood

- Being in violation of a standard is easily understood
  - Standards incorporate some or all health information
- Example – Criteria Air Pollutants
  - Health based standards
  - Some of the pollutants don't have identified thresholds
    - PM, Ozone, Lead
  - Violations don't consider how much above (or below) the standard are different areas

Criteria Air Pollutants - Exceedance of Standards

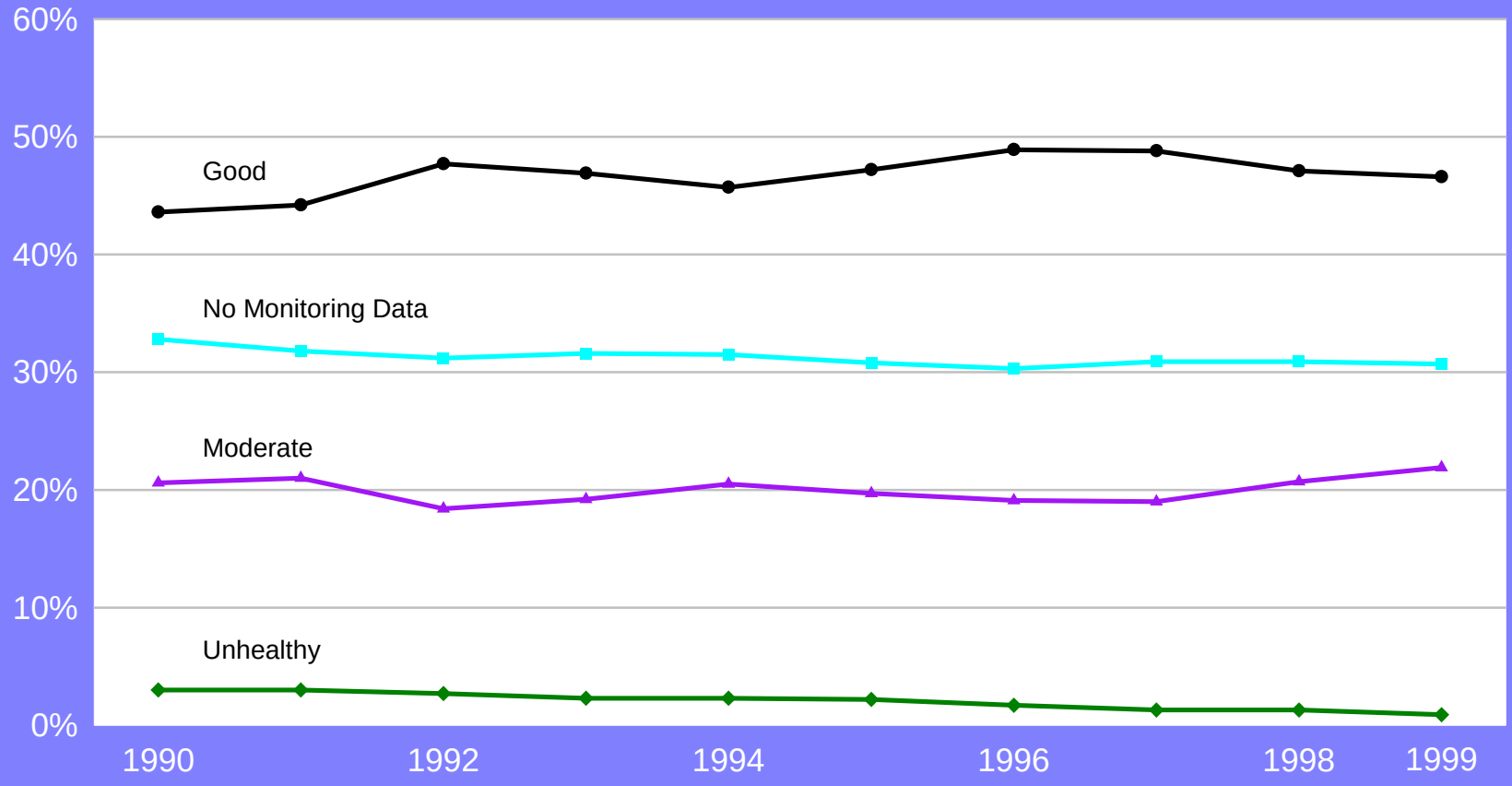
Measure E1

Percentage of children living in counties in which air quality standards were exceeded



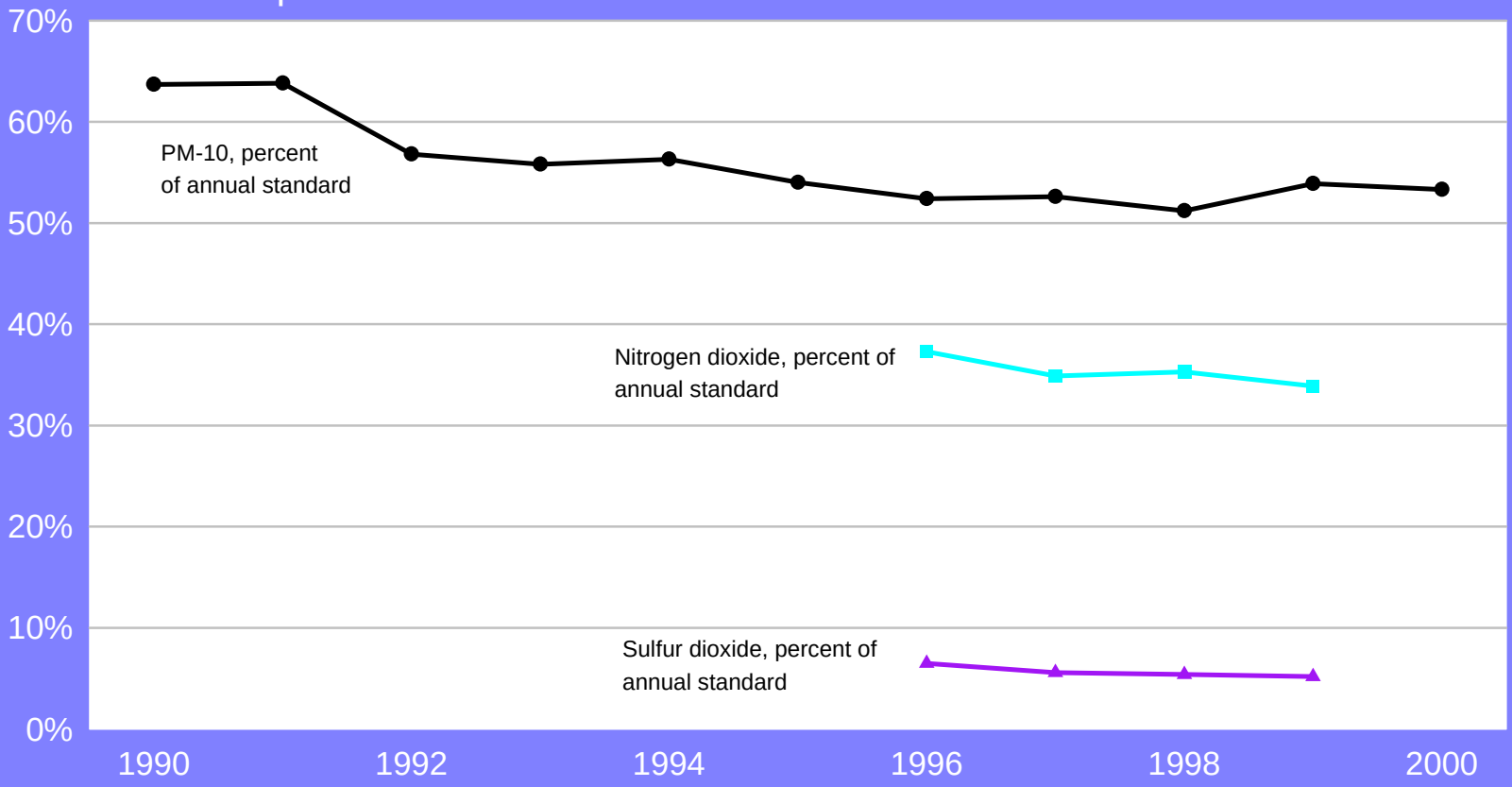
SOURCE: America's Children and the Environment, www.epa.gov/envirohealth/children
DATA: U.S. Environmental Protection Agency, Office of Air and Radiation, Aerometric Information Retrieval System

Percentage of children's days with good, moderate, or unhealthy air quality



SOURCE: U.S. Environmental Protection Agency, Office of Air and Radiation, Aerometric Information Retrieval System

Long-term trends in annual average concentrations of criteria pollutants



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Considerations

- What is the best representation for health?
  - Are there differences between the regulatory target and the science?
- How can we best measure and depict this graphically

America's Children and the Environment

Measures of Contaminants, Body Burdens, and Illnesses

http://www.epa.gov/envirohealth/children